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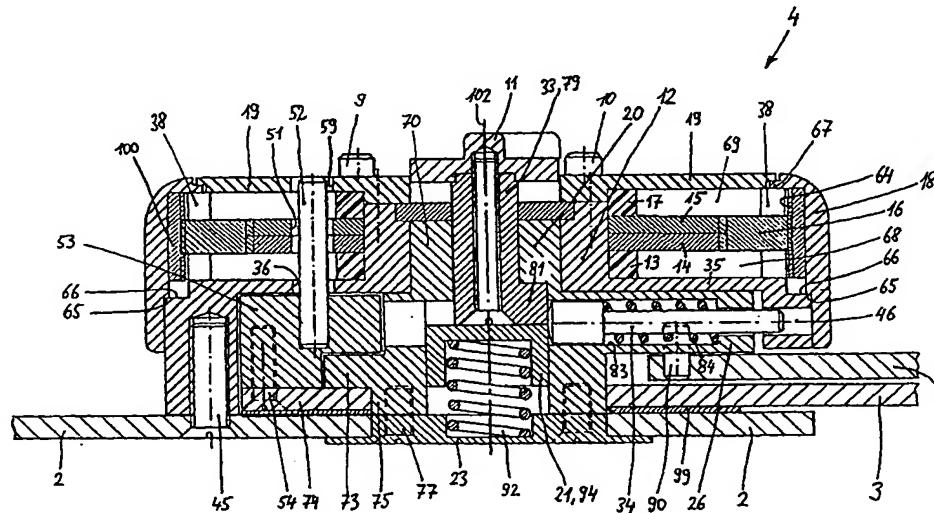
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(54) Title: ORTHESIS COMPRISING AN ADJUSTABLE RANGE OF MOVEMENT

(54) Bezeichnung: ORTHESE MIT EINSTELLBAR BEWEGUNGSBEREICH



(57) Abstract: The invention relates to an orthosis comprising a first bar (2) and a second bar (3) joined to the latter in an articulated manner, in addition to at least one click-stop dial (14, 15), for adjusting the pivoting-range stops in an extensional or flexional direction. The invention is also provided with a fixing device, which comprises a locking disc (16) that is mounted in a rotationally fixed manner in relation to the first bar (2) and can be displaced in the direction of the pivoting axis (102), for blocking the click-stop dial (14, 15). The locking disc (16) can be moved by being displaced between a position that blocks the click-stop dial (14, 15) by radial impingement, in which the locking disc (16) engages with the click-stop dial (14, 15) in a locking positive fit and a release position, in which the locking disc (16) is disengaged from said click-stop dial (14, 15).

[Fortsetzung auf der nächsten Seite]



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## ORTHESIS COMPRISING AN ADJUSTABLE RANGE OF MOVEMENT

The invention relates to an orthesis, for example an elbow orthesis, particularly for reduction of extension and/or flexion deficits, in accordance with the preamble of claim 1.

Joint capsules and/or connective tissue, in particular, often have an extension deficit and/or flexion deficit after, for example, ligament operations, accidents, inflammation, etc. This means that a distal body part, for example a forearm, can no longer be brought completely to its normal extension or flexion position in relation to a proximal body part, for example an upper arm.

As is known, orthoses are used to guide such joints, particularly during movement. Moreover, the orthesis is intended to limit the movement of the joint in the extension and/or flexion direction in such a way that injuries caused by excessive strain are ruled out.

Moreover, in order to stretch out the contractions and shrinkages in the area of the joint, use is also made of what are referred to as quengel devices, i.e. orthoses which are pretensioned by a spring and which support the movement of the body part as far as the desired extension or flexion limit.

In orthoses, the extension and flexion limit stop must be able to be adjusted within wide limits in order to satisfy the individual requirements of the patient. Moreover, it is desirable to permit straightforward and rapid adjustability of the pivot range limits so that, with increasing mobilization of the joint, the pivot range limits can be suitably readjusted with ease and speed.

To limit the pivot range, known orthoses used for stretching have limit stop pins which can be inserted into different bores arranged around the pivot axis. A disadvantage of these, however, is that adjustment of the extension and flexion limit stop is possible only in fairly large increments, for example in 15° increments, and the pivot range limits for this reason often cannot be adjusted with sufficient precision.

10 US 5,873,847 discloses an orthosis in which there are no insertable limit stop pins, but instead two click-stop dials arranged one behind the other for adjusting the pivot range limits in the extension direction and flexion direction. To block these click-stop dials, a  
15 fixing device is provided in the form of two pressure plates which can be clamped together by means of a screw and in this way clamp the click-stop dials lying between them. A disadvantage of this, however, is that in order to adjust the pivot range limits, a tool is  
20 needed for releasing the fixing device and then for clamping it together again. Such a tool is often not immediately to hand when needed. Another problem is that the click-stop dials have to be clamped together relatively firmly in order to rule out the possibility  
25 of undesired rotation of the limit stops. This requires that a certain force be applied when tightening and releasing the fixing device. If the fixing screw is not sufficiently tightened, this can lead to undesired rotation of the click-stop dials and thus to an  
30 overextension of the muscles, ligaments or tendons.

Therefore, it is an object of the invention to make available an orthosis of the type mentioned at the outset, with which the flexion and/or extension limit  
35 stop can be adjusted and blocked in a straightforward, rapid, precise and reliable way.

According to the invention, this object is achieved by the features of claim 1. Advantageous embodiments of the invention are described in the further claims.

5 In the orthosis according to the invention, the fixing device has a locking disk which is displaceable in the direction of the pivot axis and is mounted in a rotationally fixed manner in relation to the first bar. This locking disk can be moved, by being displaced,  
10 between a blocking position, in which the locking disk engages radially over the click-stop dial and is in locked form-fit engagement with said click-stop dial, and a release position, in which the locking disk is disengaged from the click-stop dial.

15 Thus, in the orthosis according to the invention, the locking of the at least one click-stop dial is effected by means of an axially displaceable locking disk which, in the engagement position, is in form-fit engagement  
20 with the click-stop dial and, in the release position, is no longer in contact with the click-stop dial. Axially displaceable in this context means that the locking disk is displaceable in the direction of its own axis of rotation and thus in the direction of the  
25 pivot axis of the bar hinge.

By virtue of the fact that the rotationally fixed locking disk is no longer in engagement with the click-stop dial via a force fit, but instead via a form fit,  
30 undesired rotation of the click-stop dial is excluded. The form-fit connection is expediently obtained by means of the click-stop dial having an outer toothing, and the locking disk having an inner toothing which can be moved into and out of meshing engagement with the  
35 outer toothing of the click-stop dial.

The displacement of the locking disk in the axial direction is expediently effected by means of a rotation part, for example a rotatable cover part,

which has an internal thread and is in engagement with an external thread of the locking disk. When the rotation part is moved, the locking disk moves in the manner of a spindle in the axial direction and can thus  
5 be brought into and out of engagement with the click-stop dial. When the locking disk is disengaged from the click-stop dial, said click-stop dial can be brought to the desired rotation position until the associated pivot range stop is in the desired angle position.  
10 Moreover, by turning the rotation part in the opposite direction, the locking disk is brought back into engagement with the click-stop dial and thus blocks the latter.

15 The extension and/or flexion limit stop can thus be adjusted and blocked in a very straightforward, rapid, precise and reliable way, and without using a tool.

An example of the invention is explained in more detail  
20 below with reference to the drawings, in which:

- Fig. 1 shows a perspective view of the orthosis according to the invention,
- 25 Fig. 2 shows an exploded view of the individual parts of the orthosis from Figure 1,
- Fig. 3 shows a longitudinal section through the bar hinge of the orthosis from Figure 1,
- 30 Figs 4A and 4B show an oblique view of a housing from above and from below, respectively,
- 35 Fig. 5 shows a longitudinal section through a rotation part,
- Fig. 6 shows a plan view of a cover plate,

Figs 7A

and 7B show a plan view and side view, respectively,  
of a locking disk,

5 Fig. 8 shows a perspective view of a click-stop  
dial,

Fig. 9 shows a longitudinal section through the  
housing, with inserted rotation block of a  
10 dead-point adjustment mechanism,

Fig. 10 shows a view according to Figure 9, also with  
insertion of a blocking pin with compression  
spring and an eccentric part,

15 Fig. 11 shows a perspective view of the rotation  
block,

Figs 12A

20 to 12C show a longitudinal section through the  
housing with two click-stop dials and the  
fixing device for blocking the click-stop  
dials, with the locking disk situated in the  
locking position and in two different release  
25 positions, and

Fig. 13 shows a perspective view of a portion of the  
second bar with fitted limit stop element.

30 Figure 1 depicts an orthosis 1 for reducing extension  
and/or flexion deficits of elbow joints, with a first  
bar 2 to be fastened to the upper arm, and with a  
second bar 3 which is to be fastened to the forearm and  
which is connected to the first bar 2 in an articulated  
35 manner via a bar hinge 4. They are fastened to the  
upper arm and forearm, respectively, in a known manner  
by means of half-shells 5, which are arranged on the  
first bar 2 and second bar 3, and via tapes or straps 6  
which are wound round the upper arm and forearm.

The orthosis shown is designed to be applied only on one side of the joint in question. However, it is also conceivable for a joint to be provided with two such  
5 orthoses, which are then applied on different sides of the joint.

Moreover, the orthosis shown has a spring force mechanism with a spring housing 7, in which a  
10 compression spring (not visible in Figure 1) is arranged, and with a push rod 8. By means of the push rod 8, the force of the compression spring is transmitted from the first bar 2 to the second bar 3 in such a way that a pivoting force is generated between  
15 the two bars 2, 3 both in the extension direction and in the flexion direction. It is therefore a stretching device acting at both ends. Since a spring force mechanism of this kind is already known, it is explained only insofar as is necessary for an  
20 understanding of the invention.

The orthosis illustrated permits simple and precise adjustment, without a tool, of the pivot range limits in the extension direction and flexion direction by  
25 means of two adjustment pins 9, 10, and also simple adjustment of a dead point starting from which the spring force mechanism acts in the flexion direction and extension direction, by turning a control knob 11.

30 The individual components of this orthosis are explained in detail below with reference to Figure 2. The pivot axis is indicated there by 102. The core of the bar hinge 4, which connects the two bars 2, 3 to one another, is a housing 12 (shown in more detail in  
35 Figures 4A and 4B) which is fixedly screwed onto the first bar 2 in an edge area. Arranged on the front face of the housing 12 in Figure 2 there are: an elastomer ring 13, a first click-stop dial 14 for adjusting the extension limit stop, a second click-stop dial 15 for

adjusting the flexion limit stop, a locking disk 16 which surrounds the click-stop dials 14, 15, an elastomer ring 17, a rotation part 18 (shown in more detail in Figure 5), and a cover plate 19.

5

Arranged on the rear face of the housing 12 in Figure 2 there are: a central rotation block 20 for adjusting the dead point of the spring force mechanism, a catch 21 arranged axially displaceably in the rotation block 20, the second bar 3, onto which a limit stop device 22 is fixedly screwed, the first bar 2, and a retaining plate 23.

15 The spring housing 7 containing the compression spring 24 is fixedly screwed onto the second bar 3. The compression spring 24 bears with its front end on a pressure cylinder 25 which is connected in an articulated manner to the push rod 8. At the opposite end, the push rod 8 is connected in an articulated 20 manner to a radially projecting arm 26 of the central rotation block 20. The thrust force of the compression spring 24 is thus transmitted constantly to the arm 26 by the push rod 8.

25 At the rear end, the compression spring 8 is supported on a spring-tensioning plug 27 which is designed as a spindle nut with internal thread. A spring-tensioning shaft 28, which represents a spindle, is screwed into this spring-tensioning plug 27. The spring-tensioning 30 shaft 28 can be set in rotation via a crank 29, a crankshaft 30 and gear wheels 31, by which means the spring-tensioning plug 27 is moved in the axial direction, so that the pretensioning force of the compression spring 24 can be adjusted. The gear wheels 35 31 are mounted in a gear housing 32.

Figure 2 also shows the details of the control knob 11 with which an eccentric part 33 can be turned. As will be explained in more detail later, the eccentric part



33 is used for locking and releasing a radially arranged blocking pin 34, which is mounted with possibility of longitudinal displacement in the arm 26 of the rotation block 20.

5

The individual parts and their functions will now be described in detail with reference to Figures 3 to 13.

10 The housing 12 is shown from the front in Figure 4A and from the rear in Figure 4B. The housing 12 has a plane middle wall 35 which is interrupted by a longitudinal slit 36 in the shape of an arc of a circle. The longitudinal slit 36 extends over about 180°. Extending upward and perpendicularly from the middle wall 35  
15 there is a circumferential wall 38 which is interrupted by slits 37 distributed uniformly about the circumference and which thus forms individual fingers. The width of the slits 37 corresponds approximately to the width of the fingers. Moreover, protruding above  
20 the middle wall 35 there is a central sleeve portion 39 which serves as a rotation bearing for the click-stop dials 14, 15 shown in Figure 8. Middle wall 35 and sleeve portion 39 have a central bore 40 running continuously through them.

25

As can be seen from Figure 4B, a circumferential wall 41 extends above the rear face of the middle wall 35. The height of the circumferential wall 41 is higher in a first circumferential portion 42 than in a second  
30 circumferential portion 43. Situated in the first circumferential portion 42 there are several axially oriented threaded bores 44, allowing the first bar 2, which bears on the first circumferential portion 42, to be screwed tight by means of screws 45 (Figure 3). The  
35 height of the second circumferential portion 43 is reduced compared to the first circumferential portion 42, along a circumferential length of about 200°, so as to create a corresponding free space for the first bar 2 and the push rod 8 which extend radially beyond the

second circumferential portion 43. Provided in the second circumferential portion 43 there are also a plurality of radial blocking bores 46 which are spaced apart uniformly in the circumferential direction and into which the blocking pin 34 of the central rotation block 20 can be introduced, by which means the rotation position of the rotation block 20 relative to the housing 12 is blocked. The rotation position of the rotation block 20, and thus that of the coupling point 47 (Figure 2) of the push rod 8 on the arm 26, can thus be adjusted by means of the rotation block 20, with the blocking pin 34 drawn back, first being turned to the desired rotation position, whereupon the blocking pin 34 is latched in the desired blocking bore 46. This procedure is described in more detail below.

As can be seen from Figure 3, the first elastomer ring 13, closely surrounding the central sleeve portion 39, sits on the plane middle wall 35 of the housing 12. The first click-stop dial 14 sits on the first elastomer ring 13, followed by the second click-stop dial 15 and the elastomer ring 17.

These click-stop dials 14, 15 are of largely identical design, so that in Figure 8 only one of these click-stop dials 14, 15 is shown. The click-stop dials 14, 15 are circular and have a central through-opening 49, so that they can be fitted with slight play onto the central sleeve portion 39 of the housing 12. The central sleeve portion 39 thus forms a rotation bearing for the click-stop dials 14, 15. Moreover, the click-stop dials 14, 15 can also move axially slightly, as far as is permitted by the elastomer rings 13, 17 between which they are clamped and which are made of relatively soft material.

On their outer circumference, the click-stop dials 14, 15 have a relatively fine outer toothing 50, which is shown diagrammatically in Figure 8. Between the outer

circumference and the through-opening 49, a continuous longitudinal slit 51 in the shape of an arc of a circle extends over an angle range of approximately 200°. The two click-stop dials 14, 15 are mounted in such a way  
5 that the two longitudinal slits 51 can at least for the most part be made congruent, and these in turn lie over the slit 36 of the housing 12. In this way, a limit stop pin 52 shown in Figure 3, and which is connected fixedly to the second bar 3 via a base part 53 and  
10 screws 54, can extend upward through the longitudinal slits 36, 51 from below and move along these. Since the click-stop dials 14, 15 are blocked via the outer toothings 50 in a rotationally fixed manner relative to the housing 12 and thus relative to the first bar 2,  
15 the limit stop pin 52 can move inside the longitudinal slits 36, 51 until it has arrived at the end of the longitudinal slits 51 and either strikes against the limit stop 55 or against the opposite limit stop 56. It is thus evident that the position of the pivot range  
20 limits depends on the position of the limit stops 55, 56 relative to the housing 12 and, consequently, to the first bar 2, and that, by independent turning of the click-stop dials 14, 15 relative to the housing 12, the pivot range limits in the flexion direction and  
25 extension direction can be adjusted independently of one another.

In order to be able to rotate the click-stop dials 14, 15 to the desired rotation position after they have  
30 been unlocked (in a manner which is described in more detail below), each click-stop dial 14, 15 has, as can also be seen from Figure 3, an adjustment pin 57, 58 which protrudes upward through a longitudinal slit 59 shaped as an arc of a circle in the cover plate 19  
35 (Figure 6) and projects slightly upward over the cover plate 19, so that the adjustment pins 57, 58 can be moved with the fingers. Along this longitudinal slit 59, a suitable scale 60 is set out on the cover plate 19 so as to make it possible to read off the position

of the limit stops 55, 56 and thus the pivot range limits in the flexion direction and extension direction.

5 The click-stop dials 14, 15 are locked in the desired rotation position via the locking disk 16, which is shown in more detail in Figures 7A and 7B. The locking disk 16 is of annular design and has a clear internal diameter corresponding to the external diameter of the  
10 click-stop dials 14, 15. On the inner circumferential wall, the locking disk 16 has an inner toothing 61 which can be brought into engagement with the outer toothing 50 of the click-stop dials 14, 15. Moreover, the locking disk 16 has radial projections 62 which are  
15 distributed uniformly about its outer circumference and whose length (in the circumferential direction) corresponds to the width of the slits 37 in the circumferential wall 38 of the housing 12. When the locking disk 16 is fitted in the housing 12, the radial  
20 projections 62 extend through the slits 37 of the housing 12, so that the locking disk is received in the housing 12 in a manner fixed in terms of rotation, but axially displaceably. The external diameter of the radial projections 62 is also slightly greater than the  
25 external diameter of the circumferential wall 38 of the housing 12, so that the radial projections 62 extend radially outward slightly beyond the circumferential wall 38.

30 The locking disk 16 can be displaced axially relative to the housing 12 by means of the rotation part 18. For this purpose, the radial projections 62 have an external thread 63 which is in engagement with an internal thread 64 (Figure 5) of the rotation part 18.  
35 The substantially sleeve-shaped rotation part 18 forms the radial outer jacket of the bar hinge 4 which covers the upper part of the housing 12, including the circumferential wall 41 in which the blocking bores 46 are located. The rotation part 18 is not axially

displaceable, but is fitted rotatably on the housing 12. For this purpose, the rotation part 18 has, in its lower third, a radially inwardly projecting shoulder 65 which rests on an edge projection 66 of the housing 12 (Figure 3) and fixes the rotation part 18 axially toward the bottom. An axial displacement of the rotation part 18 toward the top is prevented by a radially inwardly projecting shoulder 67 which is located at the upper end of the rotation part 18 and over which the edge of the cover plate 19 engages.

As can also be seen from Figure 3, an axial free space 68 is present between the plane middle wall 35 and the first click-stop dial 14, because of the elastomer ring 13 lying between them. In the same way, an axial free space 69 is present between the second click-stop dial 15 and the cover plate 19, because of the elastomer ring 17 lying between them. The height of the free spaces 68, 69 is slightly greater than the thickness of the click-stop dial 14, 15. Because they have the same height, the elastomer rings 13, 17 hold the click-stop dials 14, 15, when viewed in the axial direction, in the center between the middle wall 35 and the cover plate 19.

The locking disk 16 forms, together with the rotation part 18, a fixing device for releasing and for blocking the click-stop dials 14, 15.

The locking disk 16, which has the same thickness as the two click-stop dials 14, 15 taken together, can be moved up or down in the manner of a spindle by turning the rotation part 18, as is shown in Figures 12A to 12C. In Figure 12A, the locking disk 16 is situated at the same height as the two click-stop dials 14, 15. Both click-stop dials 14, 15 are therefore in engagement with the inner toothing 61 of the locking disk 16 and are blocked by the latter in terms of rotation. When the rotation part 18 is turned in a

defined direction, the locking disk 16 can be displaced upward until the lower click-stop dial 14 is disengaged from the locking disk 16. This state is shown in Figure 12B. The lower click-stop dial 14 can therefore be brought by hand to the desired rotation position by means of the adjustment pin 57, for example in order to adjust the extension limit stop. If the rotation ring 18 is then turned in the opposite direction, the locking disk 16 can be moved downward until the upper click-stop dial 15 is disengaged from the locking disk 16. This state is shown in Figure 12C. The upper click-stop dial 15 can now be turned to the desired position by means of the adjustment pin 58, for example in order to adjust the flexion limit stop. When both click-stop dials 14, 15 have been correctly adjusted, the rotation part 18 is screwed back again until the locking disk 16 locks both click-stop dials 14, 15 (Figure 12A).

Since, upon axial movement of the locking disk 16 from the position shown in Figures 12B or 12C to the middle position shown in Figure 12A, it can happen that the inner toothing 61 of the locking disk 16 does not mesh properly with the outer toothing 50 of the click-stop dials 14, 15, and instead thread teeth strike against thread teeth, the elastomer rings 13, 17 are made relatively soft and permit yielding of the click-stop dials 14, 15 in the axial direction. In this way, mutual engagement of the toothings is made easier.

The cover plate 19 is shown in Figure 6. As can be seen, the top face bears the indications "Flexion adjustment", "Stop" and "Extension adjustment". These indications show in which direction the rotation part 18 has to be turned in order to free the click-stop dial for the flexion limit stop or the click-stop dial for the extension limit stop. In the "Stop" position, both click-stop dials 14, 15 are locked.

Referring to Figures 9 to 11, the dead-point adjustment mechanism is now described in more detail, with which mechanism it is possible to adjust the dead point starting from which the direction of action of the spring force mechanism is reversed from flexion to extension, or vice versa. For this purpose, the central rotation block 20, which is shown in detail in Figure 11, has a cylindrical portion 70 which is fitted into the central bore 40 of the housing 12 and is mounted so as to be able to rotate therein. Adjoining the cylindrical portion 70 there is a cylindrical portion 72 of greater diameter, on which the arm 26 is integrally formed in such a way that it extends radially away from the portion 72. A circumferential radial projection 73 adjoins the cylindrical portion 72. This radial projection 73 serves as a bearing surface for the circular end portion 74 of the second bar 3. Adjoining the radial projection 73 there is a cylindrical portion 75 (Figure 11) which serves as a radial bearing for the second bar 3. Axial threaded bores 76 are provided in the cylindrical portion 75 in order to be able to screw tight the retaining plate 23 by means of screws 77 indicated in Figure 3.

As can be seen from Figures 9 and 10, a central axial bore 78 is located in the cylindrical portion 70 of the rotation block 20, in which a cylindrical portion 79 of the eccentric part 33 is rotatably mounted. The bore 78 opens into a circular pocket 80 of greater diameter which is arranged eccentrically with respect to the bore 78. The pocket 80 is used to receive an eccentric cylinder portion 81 of the eccentric part 33, so that the latter cannot turn when the eccentric cylinder portion 81 lies in the pocket 80. This position is shown in Figure 10.

The pocket 80 is adjoined by an axial, central bore 82 of greater diameter. The diameter of this bore 82 is such that the eccentric part 33 can be turned in any

desired way when it has been displaced upward from the position shown in Figure 10 in the axial direction, i.e. in the direction of the arrow 91, and so far that the eccentric cylinder portion 81 is situated above the pocket 80.

Directly above the pocket 80, as can be seen from Figure 9, a radial bore 83 extends through the whole arm 26 and is used for receiving the blocking pin 34 and a compression spring 84 (Figure 10). In an outer end portion 85, the bore 83 has a smaller diameter, so that a shoulder 86 is formed on which the outer end of the compression spring 84 is supported. The blocking pin 34 has a shaft 87 and a head 88 of greater diameter on which the opposite end of the compression spring 84 is supported. The length of the blocking pin 34 is also such that its outer end protrudes beyond the arm 26 and into one of the blocking bores 46 when the opposite end of the head 88 is flush with the wall of the bore 82. When, in this state which is shown in Figure 10, the eccentric cylinder portion 81 of the eccentric part 33 is situated inside the pocket 80, the blocking pin 34 cannot move back into the bore 82, because it strikes against the eccentric cylinder portion 81. The blocking pin 34 is thus locked in a manner preventing a rotation movement of the rotation block 20 relative to the housing 12. The coupling point 47 (Figure 2), which is formed by an axial bore 89 in the arm 26 (Figure 10) and by a hinge pin 90 (Figure 3) fastened in the push rod 8 and engaging in the bore 89, is thus fixed relative to the housing 12.

In order to adjust the coupling point 47 and thus the dead point of the spring force mechanism, the eccentric part 33 is displaced in the direction of the arrow 91 (Figure 10) counter to the force of a compression spring 92 (Figure 3) by means of turning the control knob 11 until the eccentric cylinder portion (81) lies outside the pocket 80. The eccentric part 33 can then



be turned through  $180^\circ$  by means of the control knob 11, which is connected to the eccentric part 33 in a rotationally fixed manner via a square part 93, as a result of which the blocking pin 34 moves back into the bore 82 under the force of the compression spring 84, and the opposite end of the blocking pin 34 can emerge from the blocking bore 36. The rotation block 20 can now be rotated farther to another desired blocking bore 46, whereupon the blocking pin 34 is brought back into the locking engagement position by means of turning the eccentric part 33 back.

With the blocking pin 33 unlocked, the rotation block 20 is rotated to the desired position relative to the housing 12 by means of the second bar 3, which can be connected in a rotationally fixed manner to the rotation block 20 via the catch 21 shown in Figures 2 and 3. The catch 21 has a hub-shaped middle part 94, from which two wings 95 extend in opposite directions.

20

In normal operation of the orthosis, i.e. when the eccentric part 33 in Figure 10 is at the lowest position shown, the hub-shaped middle part 94 of the catch 21 is arranged at the lowest possible position inside the bore 82, the wings 95 lying deep in radial grooves 96 of the central rotation block 20 (Figure 11). In this state, the wings 95 do not extend upward past the radial projection 73, so that the second bar 3 can turn about the cylindrical portion 75 of the rotation block 20. However, if the eccentric part 33 is pushed upward in order to unlock the blocking pin 34 (see arrow 91 in Figure 10), the catch 21 is thus also pushed upward, as a result of which the wings 95 can be pushed axially into the area of the cylindrical portion 75 and into lateral grooves 97 (Figure 13) which extend radially outward from the central bearing bore 98 of the second bar 3. In this way, the second bar 3 is connected in a rotationally fixed manner to the rotation block 20, so that the latter can be turned in

the desired manner by means of the second bar 3 when the blocking pin 34 is unlocked.

As can be seen from Figure 3, the hub-shaped middle  
5 part 94 of the catch 21 serves to support the  
compression spring 92. The opposite end of the  
compression spring 92 is supported on the outer,  
central retaining plate 23. If the eccentric part 33 is  
10 turned in such a way that the eccentric cylinder  
portion 81 can move back into the pocket 80 of the  
rotation block 20, the compression spring 92 presses  
the catch 21 together with the eccentric part 33 back  
into the position shown in Figure 3. In this way, the  
15 wings 95 of the catch 21 disengage from the lateral  
grooves 97 of the second bar 3, so that the latter can  
be pivoted again within the set pivot range limits  
about the rotation block 20 and thus relative to the  
first bar 2.

20 To minimize the friction between the circular end part  
of the first bar 2 and the circular end part of the  
second bar 3, a shim element 99 is inserted between  
these end parts, as can be seen from Figure 3.

25 In the illustrative embodiment shown, the internal  
thread 64 of the rotation part 18 (Figure 5) is  
arranged, for production engineering reasons, on a  
separate thread ring 100 which is connected by means of  
a suitable adhesive to a jacket 101 of the rotation  
30 part 18. Alternatively, however, it is also entirely  
possible to form the internal thread 64 directly on the  
jacket 101.

The invention has been described taking the example of  
35 an elbow orthosis, but it can be used for other  
orthoses too, for example knee orthoses.

Patent claims

1. An orthosis with
- 5       - a first bar (2) which can be fastened to a first body part,
- a second bar (3) which can be fastened to a second body part,
- 10       - a bar hinge (4) for pivotable connection of the first and second bars (2, 3),
- at least one click-stop dial (14, 15) which is rotatable about a pivot axis (102), can be blocked in different rotation positions and is used for adjusting a pivot range limit, and
- 15       - a fixing device for blocking the click-stop dials (14, 15),
- characterized in that the fixing device has a locking disk (16) which is displaceable in the direction of the pivot axis (102), is mounted in a rotationally fixed manner in relation to the first
- 20       bar (2) and can be moved, by being displaced, between a blocking position, in which the locking disk (16) engages radially over the click-stop dial (14, 15) and is in locked form-fit engagement
- 25       with said click-stop dial (14, 15), and a release position, in which the locking disk (16) is disengaged from the click-stop dial (14, 15).
2. The orthosis as claimed in claim 1, characterized
- 30       in that the click-stop dial (14, 15) has an outer tothing (50), and the locking disk (16) has an inner tothing (61) which can be moved into and out of meshing engagement with the outer tothing (50) of the click-stop dial (14, 15).
- 35       3. The orthosis as claimed in claim 1 or 2, characterized in that the locking disk (16) has a

thread (63) and can be moved in the manner of a spindle via the thread (63).

4. The orthosis as claimed in one of the preceding  
5 claims, characterized in that the locking disk  
(16) has a thread (63) on its radial outer  
circumferential surface, and in that the fixing  
device has an axially fixed rotation part (18)  
10 which radially surrounds the locking disk (16) and  
has an internal thread (64), which rotation part  
engages with the thread (63) of the locking disk  
(16) and, when rotated, causes an axial  
displacement of the locking disk (16).
- 15 5. The orthosis as claimed in one of the preceding  
claims, characterized in that two click-stop dials  
(14, 15) are provided for adjusting the pivot  
range limits in the extension direction and  
flexion direction, said click-stop dials (14, 15)  
20 being arranged parallel and next to one another  
and being able to be blocked simultaneously by the  
same locking disk (16).
- 25 6. The orthosis as claimed in claim 5, characterized  
in that the fixing device is designed in such a  
way that, by displacing the locking disk (16) in  
one direction, the extension click-stop dial (14)  
is released, and, by displacing the locking disk  
(16) in the opposite direction, the flexion click-  
30 stop dial (15) is released.
7. The orthosis as claimed in one of the preceding  
claims, characterized in that the bar hinge (4)  
has a housing (12) fixedly connected to the first  
35 bar (2) and with a circumferential wall (38)  
partially surrounding the locking disk (16), in  
that the locking disk (16) has radial projections  
(62), and in that the peripheral wall (38) is  
provided with slits (37) through which the radial

projections (62) are guided in order to prevent rotation of the locking disk (16).

- 5 8. The orthosis as claimed in claim 7, characterized  
in that the housing (12) has a central sleeve  
portion (39) designed as a rotation bearing for  
the at least one click-stop dial (14, 15), in that  
a spring force mechanism is provided in order to  
pretension the second bar (3) relative to the  
10 first bar (2) both in the extension direction and  
in the flexion direction, and in that a dead-point  
adjustment device for the spring force mechanism  
is mounted rotatably inside the sleeve portion  
(39).
- 15 9. The orthosis as claimed in claim 8, characterized  
in that the dead-point adjustment mechanism  
comprises a rotation block (20) in which a  
blocking pin (34) is displaceably guided  
20 transversely with respect to the pivot axis (102),  
in that the housing (12) has a plurality of radial  
blocking bores (46) which are spaced apart in the  
circumferential direction of the housing (12), and  
in that an eccentric part (33) is mounted  
25 rotatably inside the rotation block (20) in order  
to keep the blocking pin (34) in engagement with a  
blocking bore (46) or to permit removal of the  
blocking pin (34) from the blocking bore (46).
- 30 10. The orthosis as claimed in claim 9, characterized  
in that the rotation block (20) of the dead-point  
adjustment mechanism is designed as a rotation  
bearing for the second bar (3).

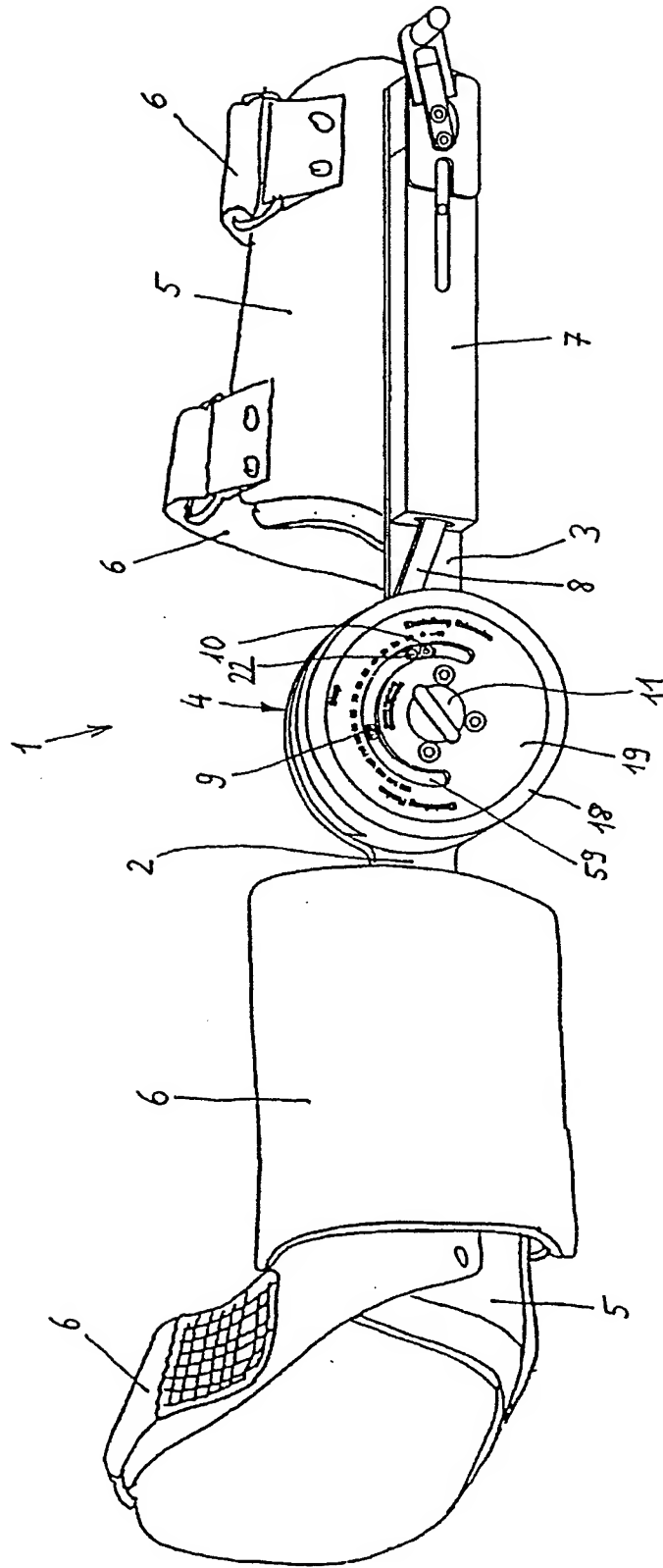


Fig. 1

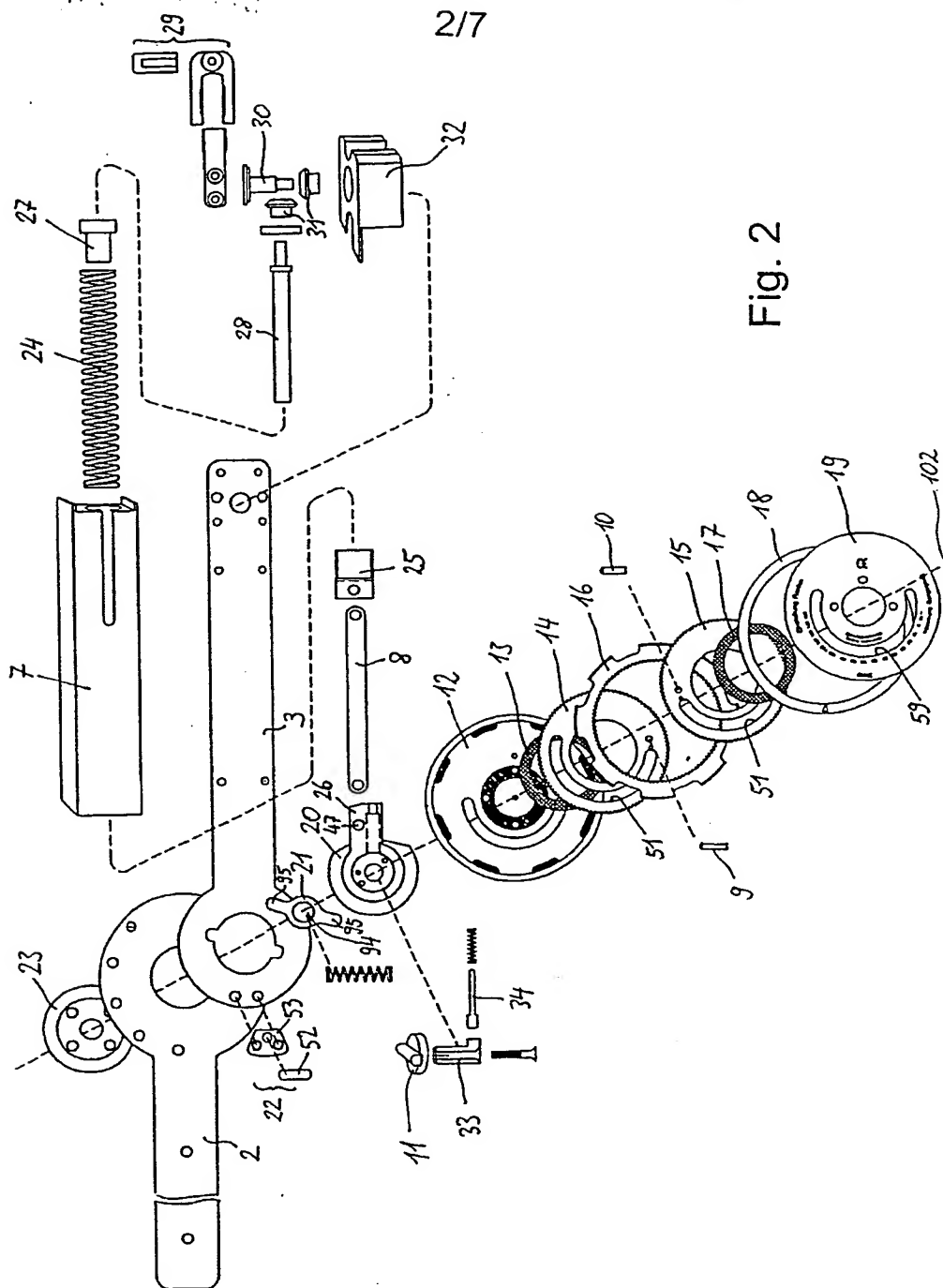


Fig. 2

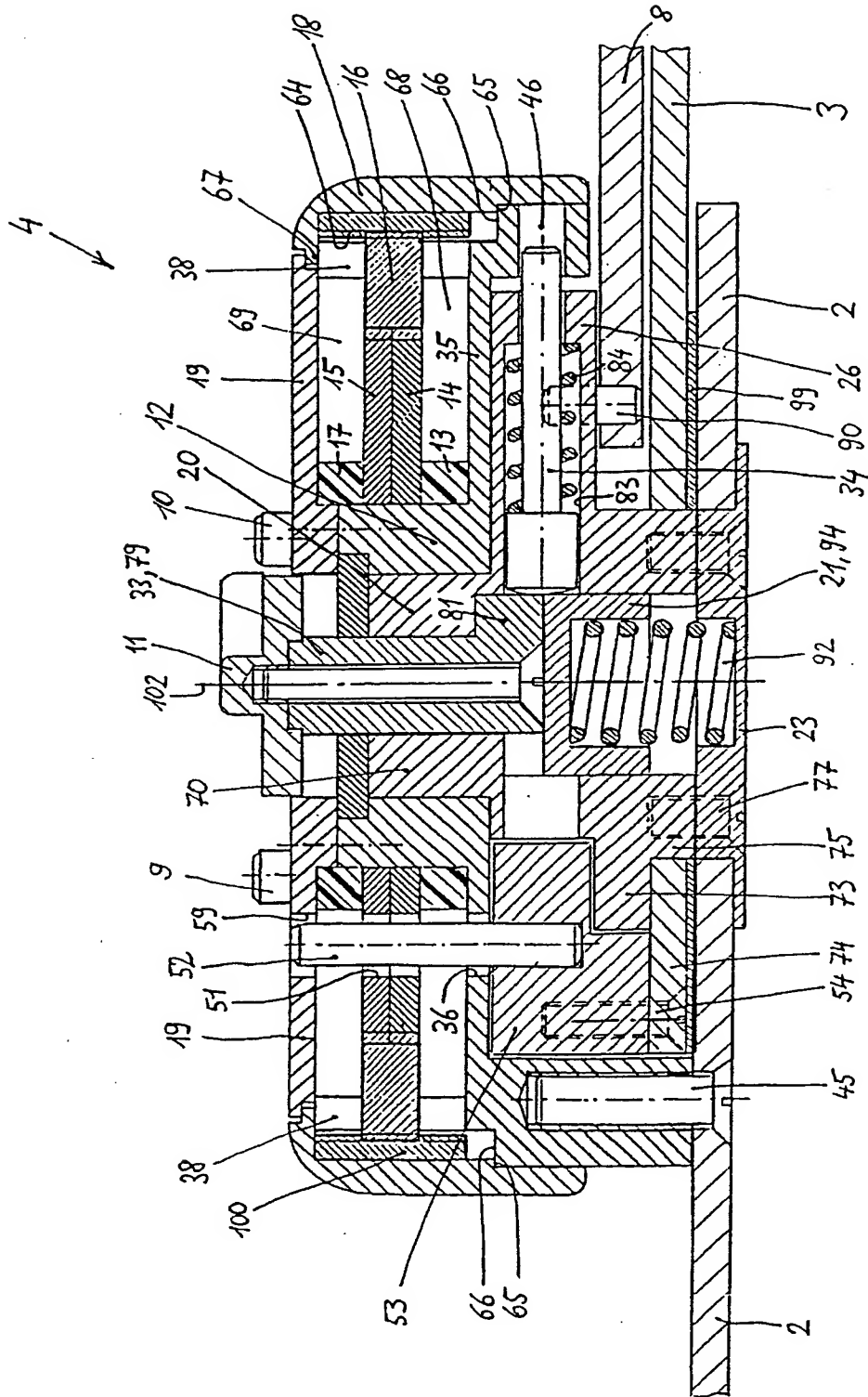


Fig. 3



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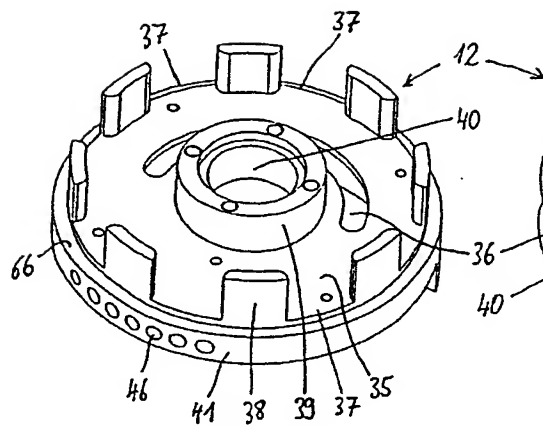


Fig. 4A

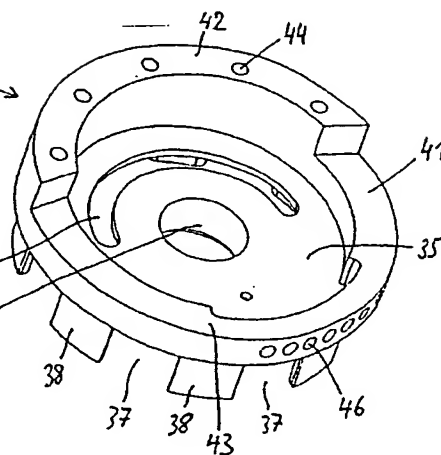


Fig. 4B

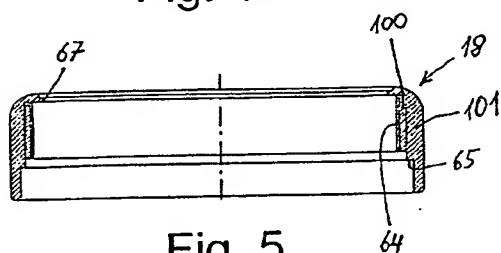


Fig. 5

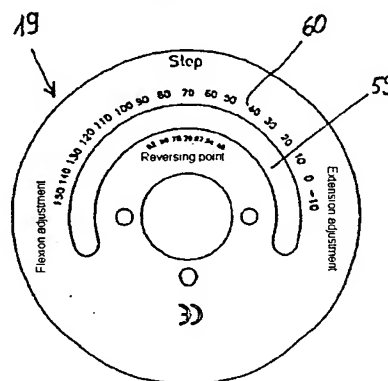


Fig. 6

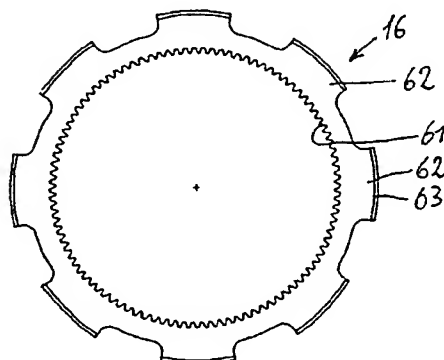


Fig. 7A

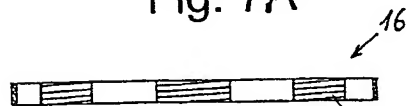


Fig. 7B

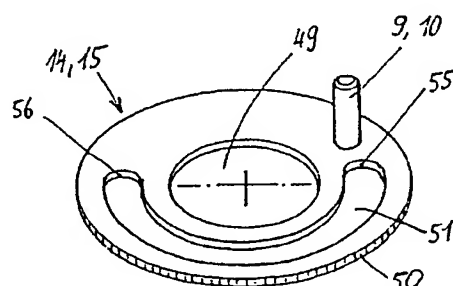


Fig. 8

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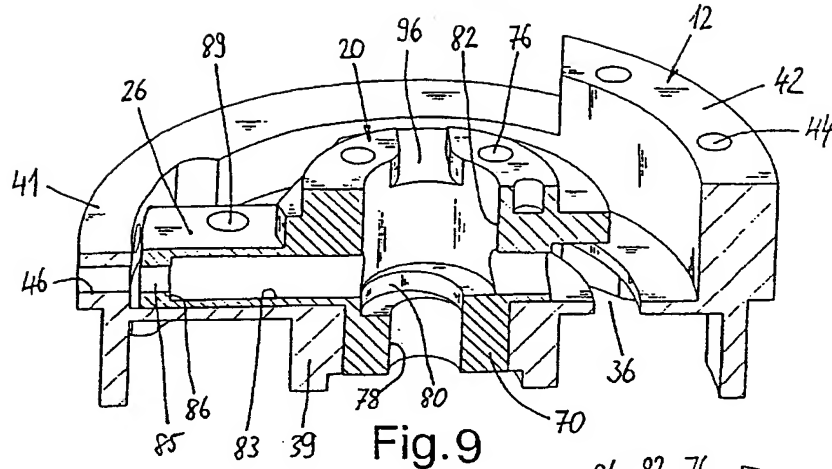


Fig. 9

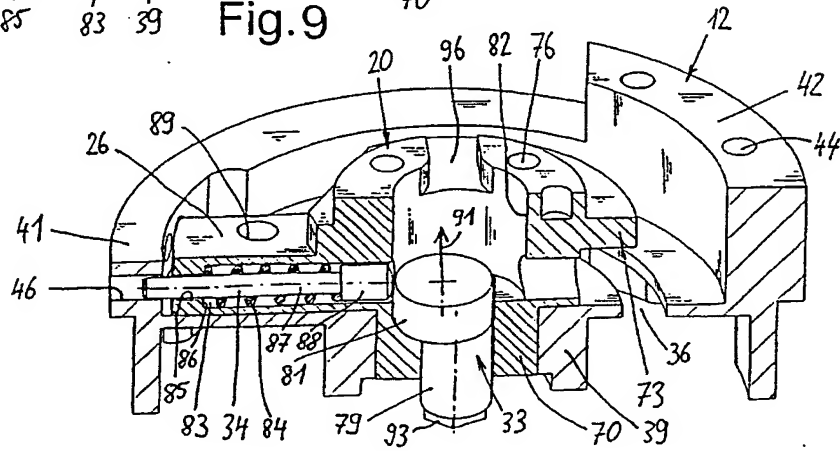


Fig. 10

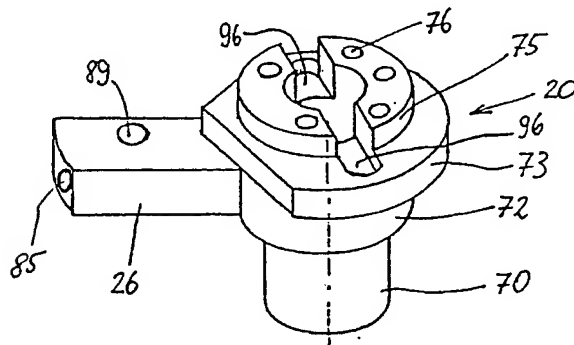


Fig. 11

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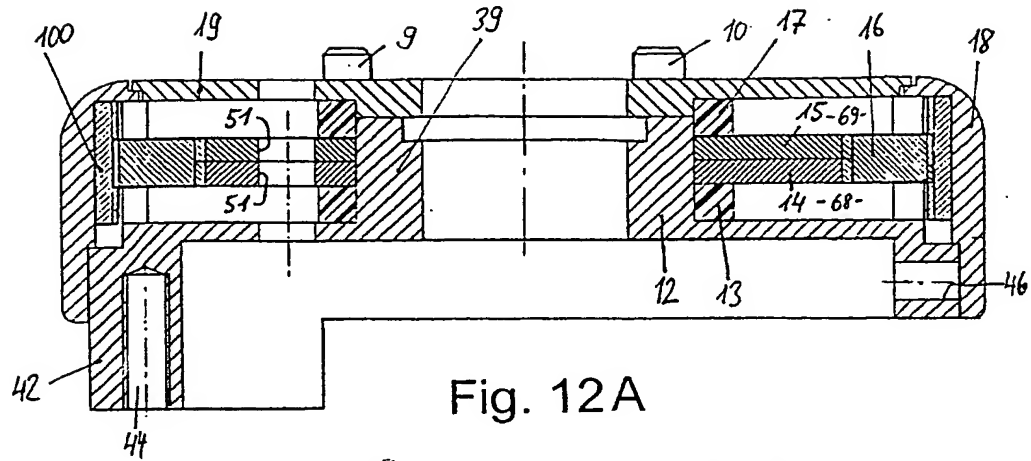


Fig. 12A

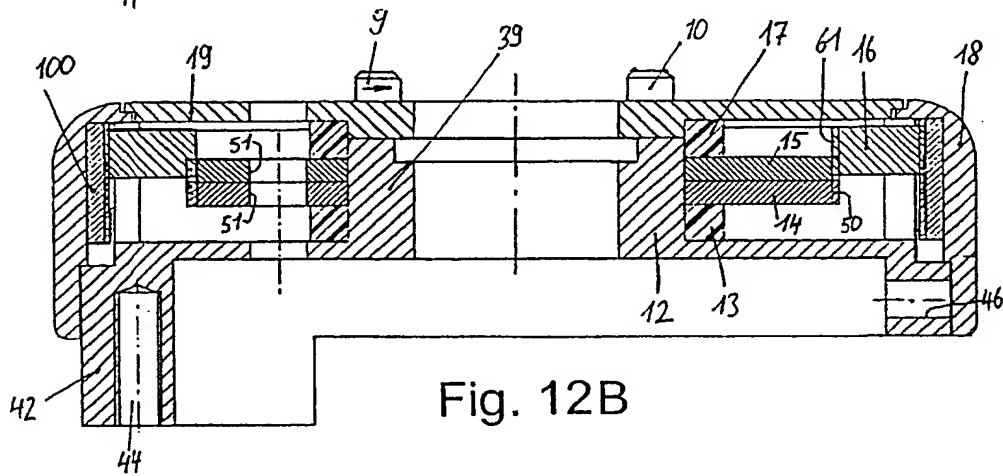


Fig. 12B

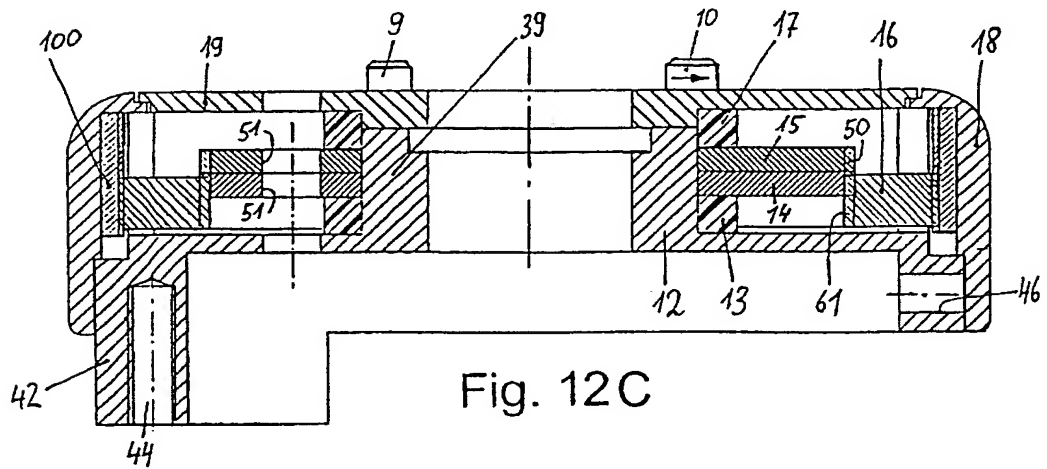


Fig. 12C

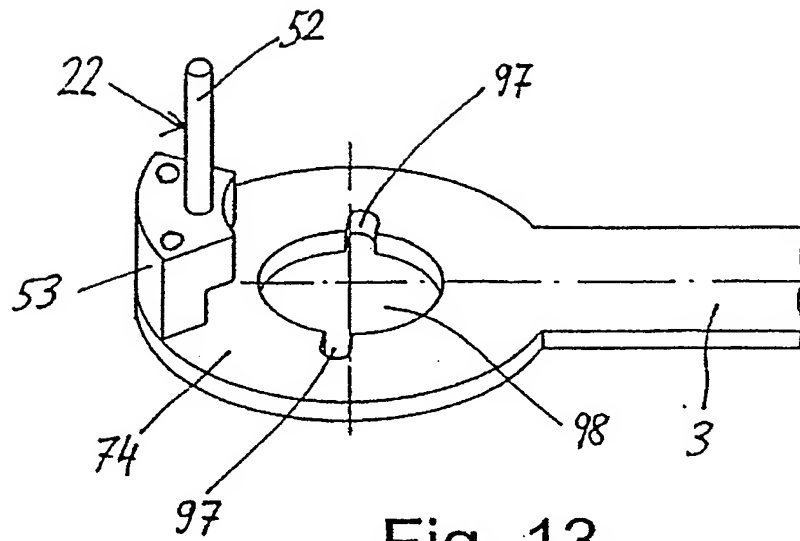


Fig. 13

# Declaration and Power of Attorney for Patent Application

## Erklärung für Patentanmeldungen mit Vollmacht

### German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

daß mein Wohnsitz, meine Postanschrift und meine Staatsangehörigkeit den im nachstehenden nach meinem Namen aufgeführten Angaben entsprechen, daß ich nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent für die Erfindung mit folgendem Titel beantragt wird:

Orthese Mit Einstellbarem

Bewegungsbereich

deren Beschreibung hier beigelegt ist, es sei denn (in diesem Falle Zutreffendes bitte ankreuzen), diese Erfindung

☒ wurde angemeldet am 20 FEB 2003  
unter der US-Anmeldenummer oder unter der  
Internationalen Anmeldenummer im Rahmen des  
Vertrags über die Zusammenarbeit auf dem Gebiet  
des Patentwesens (PCT)

PCT/EP03/01752 und am  
                     abgeändert (falls  
zutreffend).

Ich bestätige hiermit, daß ich den Inhalt der oben angegebenen Patentanmeldung, einschließlich der Ansprüche, die eventuell durch einen oben erwähnten Zusatzantrag abgeändert wurde, durchgesehen und verstanden habe.

Ich erkenne meine Pflicht zur Offenbarung jeglicher Informationen an, die zur Prüfung der Patentfähigkeit in Einklang mit Titel 37, Code of Federal Regulations, § 1.56 von Belang sind.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Orthesis Comprising an Adjustable  
Range of Movement

the specification of which is attached hereto unless the following box is checked:

☒ was filed on 20 FEB 2003  
as United States Application Number or PCT  
International Application Number  
PCT/EP03/01752 and was amended on  
                     (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

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**German Language Declaration**

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäß Title 35, US-Code, § 119 (a)-(d), bzw. § 365(b) aller unten aufgeführten Auslandsanmeldungen für Patente oder Erfinderurkunden, oder § 365(a) aller PCT internationalen Anmeldungen, welche wenigstens ein Land ausser den Vereinigten Staaten von Amerika benennen, und habe nachstehend durch ankreuzen sämtliche Auslandsanmeldungen für Patente bzw. Erfinderurkunden oder PCT internationale Anmeldungen angegeben, deren Anmeldetag dem der Anmeldung, für welche Priorität beansprucht wird, vorangeht.

Prior Foreign Applications  
(Frühere ausländische Anmeldungen)

PCT/EP03/01752 PCT

(Number)	(Country)
(Number)	(Land)

102 07 702.9 Germany

(Number)	(Country)
(Number)	(Land)

Ich beanspruche hiermit Prioritätsvorteile unter Title 35, US-Code, § 119(e) aller US-Hilfsanmeldungen wie unten aufgezählt.

(Application No.)	(Filing Date)
(Aktenzeichen)	(Anmeldetag)

(Application No.)	(Filing Date)
(Aktenzeichen)	(Anmeldetag)

Ich beanspruche hiermit die mir unter Title 35, US-Code, § 120 zustehenden Vorteile aller unten aufgeführten US-Patentanmeldungen bzw. § 365(c) aller PCT internationalen Anmeldungen, welche die Vereinigten Staaten von Amerika benennen, und erkenne, insofern der Gegenstand eines jeden früheren Anspruchs dieser Patentanmeldung nicht in einer US-Patentanmeldung, bzw. PCT internationalen Anmeldung in in einer gemäß dem ersten Absatz von Title 35, US-Code, § 112 vorgeschriebenen Art und Weise offenbart wurde, meine Pflicht zur Offenbarung jeglicher Informationen an, die zur Prüfung der Patentfähigkeit in Einklang mit Title 37, Code of Federal Regulations, § 1.56 von Belang sind und die im Zeitraum zwischen dem Anmeldetag der früheren Patentanmeldung und dem nationalen oder im Rahmen des Vertrags über die Zusammenarbeit auf dem Gebiet des Patentwesens (PCT) gültigen internationalen Anmeldetags bekannt geworden sind.

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(Aktenzeichen)	(Anmeldetag)

(Application No.)	(Filing Date)
(Aktenzeichen)	(Anmeldetag)

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Priority Not Claimed  
Priorität nicht beansprucht

20/Feb/2003

(Day/Month/Year Filed)
(Tag/Monat/Jahr der Anmeldung)

22/Feb/2002

(Day/Month/Year Filed)
(Tag/Monat/Jahr der Anmeldung)

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Status) (patented, pending, abandoned)
(Status) (patentiert, schwebend, aufgegeben)

(Status) (patented, pending, abandoned)
(Status) (patentiert, schwebend, aufgegeben)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**German Language Declaration**

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Joel D. Myers

Barry Kaplan

**POWER OF ATTORNEY:** As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (list name and registration number)

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Direct Telephone Calls to: (name and telephone number)

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Joel D. Myers

Barry Kaplan

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Unterschrift des Erfinders Datum	Inventor's signature Date <b>08/11/04</b>
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Staatsangehörigkeit <b>Deutsch</b>	Citizenship <b>German</b>
Postanschrift	Post Office Address
Vor- und Zuname des zweiten Miterfinders (falls zutreffend) <b>ALBRECHT, Erich</b> 2 - ∞	Full name of second joint inventor, if any <b>ALBRECHT, Erich</b>
Unterschrift des zweiten Erfinders Datum	Second Inventor's signature Date <b>08/11/04</b>
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Staatsangehörigkeit <b>Deutsch</b>	Citizenship <b>German</b>
Postanschrift	Post Office Address

(Im Falle dritter und weiterer Miterfinder sind die entsprechenden Informationen und Unterschriften hinzuzufügen.)

(Supply similar information and signature for third and subsequent joint inventors.)